



Virti-Cue Social Modeling Application: Production Paper

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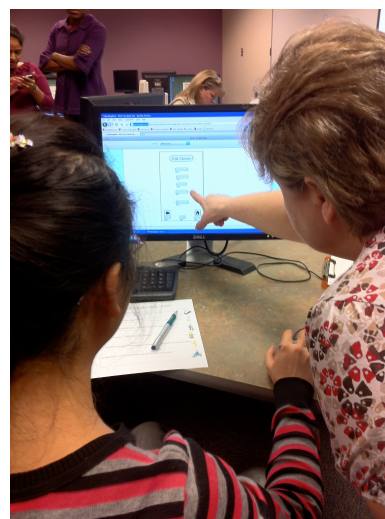
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The purpose of this paper is to describe the Production Phase of the Virti-Cue Social Modeling Application. The target audience of the application is children with Asperger's Syndrome and their parents and/or caregivers. Using Virti-Cue, parents and/or caregivers are able to create realistic social stories using still images or video to provide appropriate models for their children's developing social skills. The purpose of the Production Phase is to develop a learning application with media elements about which we will make explicit claims regarding the intended users, the learning needs of users, how the software meets those learning needs, including the choice of media, structure, and interface, what should be learned from the software, and how that learning will be assessed.

Background

To begin this phase of our development, information gathered from our Presentation Design usability testing was analyzed and used to inform our Production decisions. In feedback from our usability testing, users indicated uncertainty regarding labels on some of the frequently used buttons in the application. Users also suggested that we create a tutorial to assist first-time users. To help clarify this uncertainty regarding button names/functions and to assist first-time users, we plan to create a series of 'how to tutorials' that 'walk users through key processes' in 2 to 3 minutes. Users will be able to access the tutorials that we are developing through the Help button or on Virti-Cue's proposed website that will accompany our product. For the purpose of our production task, we will focus on an aspect in a key process in the application: creating a new story and adding



Usability Testing

pictures. Short tutorials will be created for each phase of the application to support the learning needs of our users. In the following sections, the specific ways in which our design decisions meet the needs of our intended users will be discussed. In order to develop the best design for our tutorial, we will engage in both parallel and iterative design.

Design Decisions

Animation

Having researched a number of different tutorial formats, we have decided to proceed with a stop-action animated tutorial using a combination of voice-overs/sound and text. The rationale for creating an animated tutorial is in part based on the fact that at this time we do not have a functional product with which to record a video. As well, research has demonstrated that animations can be an effective way to deliver instruction (Lowe, 2004, paragraph 2) and a short animated video lends itself well to being displayed on either computers or handheld devices, at the point of need.

As noted by Lowe (2004), animations appear to “fulfill an ‘affective’ function, that is, to attract attention, engage the learner, and sustain motivation” (Lowe, 2004, paragraph 3). Other advocates of animation believe it is beneficial for information processing by making difficult content easier to understand and by depicting dynamics explicitly (Lowe, 2004). Benefits of animation have also been claimed to include the reduction of extraneous processing because “animation requires less effort to create mental pictorial presentations, and computer control requires less effort to make choices during learning” (Mayer, Hegarty, Mayer, & Campbell, 2005, p. 257). Proponents of animation also argue that processing animations places a lower cognitive load on learners as learners do not have to “engage in cognitive processing” to animate the graphics as the computer does it for them (Mayer, et al., 2005).

Nevertheless, in spite of the oft-cited educational benefits of animation, research has failed to demonstrate conclusively that the use of animation is more effective than the use of equivalent static graphics (Ayres, Kalyuga, Marcus, & Sweller, 2005; Ayres & Paas, 2007; Mayer, et al., 2005). Ayres et al. (2005) identify two “critical characteristics” that may serve to explain the apparent lack of effectiveness of animations: 1) information is transitory, and 2) animations consist of a series of successive elements – with static graphics more time can be made available to transfer the information. Considering these limitations, Ayres et al. (2005) suggest a number of conditions under which animations may serve to be effective. For example, employing strategies that serve to lower extraneous cognitive load, such as ensuring users have sufficient prior knowledge, thus reducing demands on working memory caused by the transitory nature of animations. Other suggestions include ‘tracing’, which entails leaving information on the screen for a longer period of time and also serves to counteract the transitory nature, and employing a cuing technique to direct learners' attention (Ayres & Paas, 2007). A final suggestion that has applicability to our product is building in learner control such that learners are able to control the pace by pausing, reviewing, or fast forwarding the tutorial, again potentially reducing working memory loads.

According to Lowe (2004), two problems may be associated with dynamic explanations - that of overwhelming users, and that of underwhelming users. Users can be *overwhelmed* and unable to keep pace with the delivery if animations present complex information very rapidly. Conversely, users can be *underwhelmed* if animations are insufficiently engaging and ineffective in gaining and sustaining user attention and stimulating relevant cognitive processes for learning (Lowe, 2004). The intent of our tutorial then is to neither overwhelm nor underwhelm our users, but to achieve what Norman (2011) identifies as an appropriate level of complexity.

However, given the inconclusive evidence regarding the efficacy of animations as compared to graphical/textual explanations in learning applications, we will develop parallel designs to determine which format best meets the needs of our learners for our particular product: a dynamic animated format with combinations of voice/text, or a static graphical/textual format. In order to create an effective animation, we will employ the suggestions offered by Ayres et al. (2005) and will also strive to construct the animation in such a way as to tap the positive features of static illustrations. Factors such as user control of the pace and guiding users to attend to key steps in the process (Mayer et al., 2005) will be employed.

Voice and Text

To promote effective learning, we will include narration in our tutorials. As noted by Bishop & Cates (2001), "sounds may gain and focus learner attention, reduce distracting stimuli, and make learning more engaging" (p. 5). Sounds may also "help learners condense, elaborate on, and organize details, highlighting interconnections among new pieces of information and making connections to preexisting knowledge" (Bishop & Cates, 2001, p. 5).

We also considered including a combination of voice-overs/sound and text. Research on the use of voice or text, or combined voice and text has revealed some interesting advantages and disadvantages. Chalfonte et al. (1991) suggest voice can be more expressive than text, placing less cognitive demand on communicators and allowing more attention to be devoted to the content of the message. Another advantage of using speech in our interface is its universality; almost everyone understands spoken language as opposed to text with varied reading abilities. However, one notable disadvantage is that voice delivers information at a slower rate than text, which can be scanned or reviewed. As Nielsen (1995) points out, "a special consideration for video (and spoken audio) is that any narration may lead to difficulty for international users as

well as for users with a hearing disability.” He adds, “spoken words are sometimes harder to understand, especially if the speaker is sloppy, has a dialect, speaks over a distracting soundtrack, or simply speaks very fast ... The classic solution to these problems is to use subtitles but subtitles require special attention on the web.” We considered adding text to our tutorial for the purpose of highlighting key words, however felt that additional text on the screen would be redundant, causing an unnecessary distraction in that the key words already appeared on the Virti-Cue interface screen (see figure below).



In addition, further research on the combination of text and speech suggested a dual modality output presentation, rather than a single modality, to improve user comprehension and retention (Schwartz, 2003). “In contrast to print and audio comparisons, which generally reveal no advantage for dual over single presentations, studies show that adding pictures to print or audio generally increases learning” (Nugent, 1982, p. 164). Another study by Sipior and Garrity (1992) found that presentations with a mix of audio and visual components improved receptive

attributes such as perception, attention, comprehension, and retention. “Flexibility is extremely important to system use since different users may require different degrees of support” (Sipior & Garrity, p. 519).

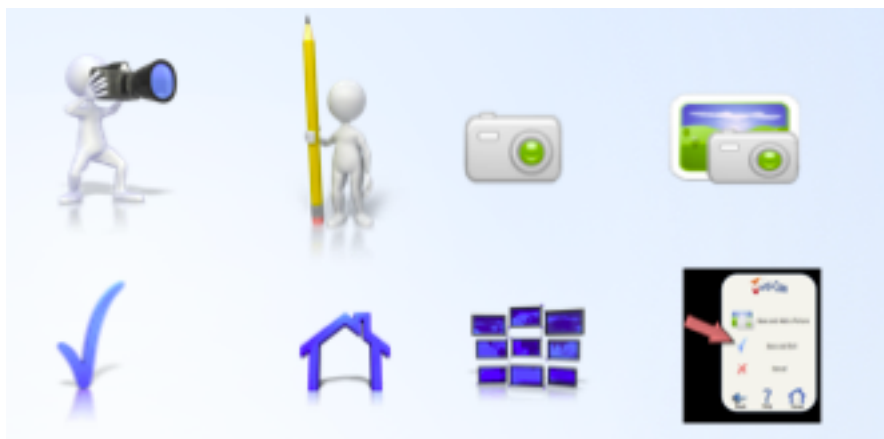
Color and Graphics

Careful consideration has gone into the choice of graphics, text, colors, and visual organization of the tutorial. In part, we wanted the tutorial to accurately reflect the appearance of the actual Virti-Cue application. Bearing in mind that our product is intended to assist children with Asperger's Syndrome learn appropriate social behaviors, we also wanted to ensure that the choices made about visual appearance would facilitate learning and not serve as a distraction. In all probability, it will be the parents or caregivers of these children who utilize the tutorials. Nevertheless, we understand that the children will often be close by and the utilization of distracting visual elements could serve as an obstacle to uninterrupted viewing.

The use of visuals should facilitate learning rather than distract from it hence visual clarity is a guiding principle in our tutorial design. “If we want people to adopt a new behaviour, it is therefore important that instructions are not only semantically clear and easy to follow, but also visually easy to read – or else the behaviour may seem unduly demanding” (Song & Schwarz, 2008). Our goal is to provide an effortless experience through minimizing the use of and simplifying both visuals and text so that our choices aid in the memory process whilst adding a level of enjoyment.

“Communicators and educators ...are well advised to present information in a form that facilitates easy processing: if it's easy to read, it seems easy to do, pretty, good, and true” (Song & Schwarz, 2008, conclusion). In general, people prefer familiar images to highly unusual examples, as they are easier to process. We have therefore used similar human-like figures

throughout the design of the Virti-Cue product, in testing by users, and in the current development of tutorial models. This consistency will help reduce distraction from the main learning goals and aid with comprehension (Malamed, 2011).



Sample Icons/Graphics

We used simplified and iconic graphics in order to reduce cognitive load, as less mental energy will be spent processing the visuals and more on recognition of their inherent meaning. As Soloman (n.d.) states, “from an instructional perspective, information contained in instructional material must first be processed by working memory....Cognitive load theory is concerned with techniques for reducing working memory load in order to facilitate the changes in long term memory” (<http://tip.psychology.org/sweller.html>). Our graphics and icons possess elements that will ease transfer, or enable deciphering, across various cultures and languages. We have consciously paid attention to choosing the “right metaphors” to simplify the use of the tutorial (<http://www.iconfinder.com/blog>) and although we aimed to keep all elements in the tutorial looking as if they belong together, we have added some visual variety as our research supports the idea of sometimes grabbing people’s attention (Skaalid, 1999b).

According to research, alignment, symmetry, and a balance of images are easier on the eye and promote greater recognition, ease of association, and understanding (U.S. Department of Health & Human Services, 2006, p. 51). We therefore maintain a similar positioning format throughout the tutorial in mimicry of the Virti-Cue product: positioning graphics to one side, text to the other, with navigational aids at the bottom of each screen. We paid attention to figure-to-background contrast in order to keep graphics clear and text legible. We chose a black background to simulate the surround of handheld devices on which the application will be utilized, such as on iPhones, and a fairly neutral, light toned background to aid in graphic distinctiveness and ease of reading text. We used a consistent and balanced color palette: blue for most outlined graphics with red as contrast for options and instructional highlighting – a circular cursor with a highlighted centre to indicate ‘click’— to focus user attention on relevant cues (Skaalid, 1999a). Visual consistency reduces user errors, improves time on the task and its completion, plus increases user satisfaction (Reynolds, 2005).

In sum, as noted by Reber, Schwarz, & Winkielman (2004), there is a diverse body of research that shows that the objective features of stimuli, like the amount of information, symmetry, or figure-ground contrast, as well as “goodness of form” (p. 377), or prototypicality, facilitate fluent processing and influence perceptual fluency and preference judgments. We removed any sense of a button border around the text as we expect our product will be accessed on a smart phone and the fewer extraneous objects the better on such a small interface. We inserted associated text to the side of related icons as research supports using text with non-textual elements when information needs to be communicated. Research suggests placing text with click-able items to aid in comprehension, even though there is evidence that pictures are more effective than text in a learning situation (U.S. Department of Health & Human Services,

2006, p. 144). We incorporated the Virti-Cue logo on each section of the tutorial to add visual appeal and brand name recognition (<http://www.grantasticdesigns.com/graphics.html>).

Essentially, the visuals and text placed in the tutorial have four functions as researched and reviewed by Levie and Lentz (1982), summarized by Skaalid (1999b), and adapted here:

- Attentional: To help remember processes and promote learning for use of the Virti-Cue application
- Affective: Enhance enjoyment and positive attitude toward the Virti-Cue application
- Cognitive: Increase comprehension, recollection, retention, and confident use of the Virti-Cue application
- Compensatory: Visuals will help users understand text and gain ability to effectively use the Virti-Cue application.

Segment Length

One of our objectives in developing an animated tutorial for Virti-Cue is to create a learning experience that is meaningful and allows for ease of use. To this end, our first tutorial stands as an episode in relation to a larger body of work. The episodic nature of these tutorials raises questions of episode length. To effectively sustain attention and produce intended results, we must gain a better understanding of how memory works. Mayes & Roberts (2001) state that "only a tiny fraction of experienced episodes are put into long-term memory storage and, even with those that are, only a small proportion of the experienced episode is later retrievable" (p. 1398). They stress the importance of providing visual information to users as "in episodes experienced by humans, visual information is usually most salient" (Mayes & Roberts, p. 1396). The use of visuals is an important aspect of our tutorial design, however, the question of the optimal length of each episode remains unanswered. Nielsen (2005) argues that "the main

guideline for producing website video is to keep it short. Typically, Web videos should be less than a minute long." Google Sketchup (http://sketchup.google.com/training/videos/new_to_gsu.html) offers a series of instructional videos varying between one and eight minutes in length. Similarly, Adobe (<http://tv.adobe.com/show/learn-acrobat-9/>) provides video tutorial support for their product lines with lengths akin to Sketchup. These examples have us questioning whether the likes of Google and Adobe have it wrong or whether there are additional factors contributing to the success of a video tutorial.

Czerwinski & Horvitz (2002) describe how “new instruction updating depends on forgetting old instructions” and “a user will operate optimally if she allows those instructions to slowly decay from memory” (p. 232). If we provide too much information at once, we will not allow Virti-Cue users enough time to “let a previous task item fade from memory” (Czerwinski & Horvitz, p. 233). Given these constraints on memory, we question whether the effectiveness of a tutorial is as much about length as it is about the amount of information required to perform a task. As we develop these video-based resources, we consider that “a user cannot attend to a future behaviour if the previous task is still requiring attentional resources in short-term memory” (Czerwinski & Horvitz, p. 233). Our goal, therefore, is to create video tutorials attending to brevity, the manner, and amount of information presented in each episode.

Assessment of Learning

In order to assess the effectiveness of our learning application in meeting the needs of our learners, we will engage in usability testing with a representative group of five users. As noted by Nielsen (2000), “the best results come from testing no more than five users.” The intent of this testing will be to determine if users develop a better understanding of the process of creating a new story and adding pictures.

We will conduct two levels of testing for our users: one to determine final tutorial design, and one to assess the transfer of learning to use of the application. We need to receive feedback and direction regarding our ultimate choice of design, hence the proposed use of parallel design. As Nielsen (2011) explains, “in a parallel design process, you create multiple alternative designs at the same time.” These multiple design prototypes are considered and tested by users. In our case, we have considered several designs but intend to test a static version against a more dynamic version. This decision was made in part due to the inconclusive evidence regarding animations, as detailed above. All components of the tutorial design are the same in both prototypes except for the use of a voice over for guidance versus textual instructions, and animation versus still images.

In order to assess the learning gains from our tutorial designs, five users will test both prototypes followed by actualization of their learning using a mock-up of Virti-Cue in Microsoft Office PowerPoint. We will alternate which of the two tutorial design models are accessed first by each of the users. A follow-up questionnaire will provide open-ended questions regarding the effectiveness of the tutorial in assisting navigation and ease of use of the Virti-Cue application, plus a segment to compare the two types of tutorial format. Specific questions concerning design choices will be included, such as layout, icon clarity, voice-over clarity, and instructional vocabulary.

We will also keep observational notes as we track users’ progress and interview our test users for their reactions and related comments, as research supports such initiatives (U.S. Department of Health & Human Services, 2006, p. 190). After the initial usability testing we will collate the data and review for design revisions as per iterative design. We will run as many tests as needed to ensure the application effectively meets our users’ needs. According to

Nielsen, conducting both parallel and iterative design methods “maximizes your chances of hitting on something better” (Nielsen, 2011).

Conclusion

To conclude, it is our hope that the Production Phase in our product development will result in a learning application with media elements that effectively and efficiently support the learning needs of our intended users. As we proceed through the evaluation stage, user feedback will be used to inform our final design decisions.

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